apparently under the influence of gravity, so as to take up the same configuration as before. This fact is highly significant in connection with the production of perfect and normal embryos, although the positions of the earlier formed blastomeres may have been so artificially shifted that their cell descendants occupy abnormal positions in the otherwise normal larva.

The correctness of this general interpretation is also supported by the readiness with which partially separated blastomeres will form double embryos. The two masses of nearly isolated cytoplasm thus develop independently, the lack of adequate contact or continuity between the corresponding parts of the two cells being apparently responsible for the monstrosity. An instructive comparison is afforded by a consideration of the results of artificially induced union of originally separate blastomeres of similar order. If these are approximated so that the axes of the different substances in each are parallel, they segment as one organism, that is, the cell division is coordinated. If, however, the axes are divergent, then each blastomere continues to segment more or less independently, and monsters of various degrees result.

These embryos, arising from isolated blastomeres of the first or following cell-generations, and also those originating from the fusion of previously isolated ones, concur in one remarkable characteristic, viz. the size of the larva at any given stage is proportionate to the relation between the cell from which the embryo actually arose, and the ovum of the species. Thus embryos from either of the first two blastomeres are half the normal size, and so on.

This variation in size is effected by a corresponding reduction in the *number* of cells that go to make up the different parts or regions of the whole, and not by a difference in their *size*. At first sight this circumstance might seem to favour the hypothesis of "unequal" nuclear divisions, *i.e.* the production of daughter cells with constantly segregating potentialities. But any such explanation is at variance both with the facts of development, taken as a whole, and with those of regeneration as well. What the evidence does seem to point to is the existence of definite substances present in the cytoplasm, and that these, though not actually representing the several organs *in parvo*, nevertheless do represent substances necessary to the formation of these organs—a very different thing. It is, then, intelligible why an organism that is left with only half the amount of any one such substance can only produce half the number of cells during cleavage; and a working hypothesis can be formed as to why regeneration is possible in some cases whilst it is apparently excluded in others. There exist strong grounds for believing that the formative stimuli leading to organogenetic development normally reside in the nucleus, but unless the substances capable of responding or of cooperating in the response to a stimulus are present, a normal result need no more be expected than that a printing machine should be capable of turning out a printed page unless the type had been inked.

But though the ground is being broken, much will have to be done before we are in a position to give a satisfactory explanation of the phenomena of development and regeneration. At present it is sufficient to analyse and investigate experimentally the agencies that are concerned in these and other vital processes; we shall thus, and only thus, be able to elevate the surviving elements of existing hypotheses to the rank of well-founded theory.

The volume by Dr. Maas will form a useful source of information for those who may desire to know what is being done in these directions. Its author does not claim to have treated the subject exhaustively, and, indeed, we could wish the sections dealing with the chemical and physical aspects of the matter had been expanded. Nor will the reader who is familiar with the work of Driesch, Roux and others perhaps find much recorded that will be new to him, but the presentation of the subject-matter is, on the whole, judicious and critical. The work covers a wider range than might be gathered from the general tenor of the present article, but as the whole subject deserves more general attention than it receives, it appeared to be more useful to attempt to indicate some of the actual results and the questions arising from them, than merely to give a discursive synopsis of a book that should be read by all who are interested in the more important biological problems of the present day.

J. B. F.

THE ALKALI AND CHLORINE INDUSTRY.

La Grande Industrie Chimique Minerale. By E. Sorel, Ancien Ingénieur des Manufactures de l'État. Pp. 679. (Paris: C. Naud, 1904.) Price 15 francs

THIS work is concerned with the alkali industry and with those manufactures which naturally group themselves around it. That is to say, it treats of soda and potash, the chief salts of sodium and potassium, the halogens, and the principal industrial compounds of the latter, such as bleaching-powder and the chlorates.

The point of view adopted is essentially that of the manufacturing chemist or chemical engineer. Generally, however, the treatment is rather broader than this might indicate. Thus the history of a process or the growth of an industry is often outlined, and the mode of occurrence of the raw materials used is described more or less fully. As further illustrating the same point we note that, in connection with hydrochloric acid, several pages are devoted to a discussion of the effects which the acid vapours discharged from chemical works produce upon the vegetation of the locality. This, again, is followed by a chapter in which the general principles of the condensation of vapours are discussed from the thermodynamical standpoint. Nor does the author disdain to lighten his pages with occasional items of miscellaneous—not to say trivial—information. We learn, for instance, that in Central Africa "les enfants courent après un morceau de sel, comme les nôtres après un bon-bon."

The salt industry is dealt with in the opening chapter. There is a good description of the production of salt from sea-water, and some particulars of the salt deposits of Cordova, Lorraine, Stassfürt, and Transyl-

vania are included. The treatment of the mother-liquors for the recovery of potassium salts leads then to the next chapter, in which the production of potassium chloride and sulphate is described.

Here in this second chapter we have an instance, graphically told, of the kaleidoscopic changes which an unexpected discovery may sometimes bring upon a seemingly permanent industry. Balard, the discoverer of bromine, had devoted some years of his life to the creation of a new manufacture—the recovery of potassium salts from sea-water, to wit—for the benefit of his beloved Provence. The methods were worked out satisfactorily, an influential company was formed, and everything promised a great commercial success. In fact, the products were already on the market when news came of the discovery, in the "dead lands" round the little Prussian town of Stassfürt, of those great deposits of potassium and magnesium salts which have since made the district famous. Down went the price of potassium chloride to less than one-half its former figure, and with the fall vanished the new French industry. It did not, indeed, succumb without a brave little struggle, and during this the processes were so much improved that, as the author apparently thinks, a fortunate chance might even now bring them to the front again. But at that time, at any rate, the fight was hopeless, and the works round Stassfürt were speedily left victors in the markets which they have ever since controlled.

Potassium carbonate from vegetable sources is next treated of. The burning of plants for the sake of their "potashes" the author regards as a barbarous and brutal kind of industry. It appears that the march of civilisation in the United States is shown by the gradual shifting of the centres where potassium carbonate is prepared—a remark which recalls, though antithetically, the epigram about a nation's progress being measured by the sulphuric acid it requires. It is interesting to note that although at one time potash was largely displaced by soda in manufacturing processes, yet now, thanks to agricultural requirements, the demand for potassium salts is greater than ever.

Iodine and bromine form the subject of chapter iv., and are clearly if somewhat shortly described. The next twelve chapters are occupied chiefly with the soda industry. The ammonia-soda process is lucidly dealt with in two short chapters, and a considerable amount of space is devoted to the Leblanc process. The author justifies this on the ground that the latter method has still some vitality left, and is always capable of making progress. Much of the description is certainly interesting, especially that giving personal details of the discoverer, his successes, and his vicissitudes. But the interest is mainly historical. Even in this country the battle of the ammonia *versus* the Leblanc process can hardly be said to be so doubtful in its issue as the author seems to think it. The electrolytic method is barely mentioned; a little more space might well have been devoted to it.

In any adequate account of the alkali industry this country must figure largely, and such names as those of Gossage, Hargreaves, Mactear, Muspratt, and Mond receive due mention in the present work. The English Alkali Acts, too, although regarded as "Draconian," are nevertheless commended. Indeed, the author is inclined to attribute much of the progress which the alkali manufacture has made in Great Britain to the fact that the makers were forced to collect their hydrochloric acid instead of distributing it broadcast over the countryside. It is, of course, an old story, but it will bear recalling, how, in spite of the great clamour raised, the alkali manufacturers were compelled to take those steps which eventually proved to be their economic salvation. The rejected stone became the headstone of the corner; the troublesome by-product presently supported the whole industry.

Chlorine, bleaching-powder, and chlorates are dealt with in the last five chapters. There is nothing particularly new, but the descriptions include the standard processes, such as those of Deacon, Weldon, Dunlop, Mond, and Péchiney, and give a good general idea of this branch of chemical industry.

The work contains a number of illustrations, but lacks an index. It will be useful to those who require something more complete than a general text-book description, but less extensive than Lunge's standard treatise.

C. SIMMONDS.

THE ELEMENTS OF ELECTRICAL ENGINEERING.

Electricity and Magnetism. By C. E. Ashford, M.A. (London: Edward Arnold, n.d.) Price 3*s.* 6*d.*

Electric and Magnetic Circuits. By Ellis H. Crapper, M.I.E.E. (London: Edward Arnold, n.d.) Price 10*s.* 6*d.*

A Text-book of Electrical Machinery. Vol. i. Electric, Magnetic and Electrostatic Circuits. By H. J. Ryan, H. H. Norris, and G. L. Hoxie. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1903.) Price 2.50 dollars.

THE best method of training electrical engineers will probably remain a subject of discussion so long as the profession continues to be a profitable one. Whether recourse should be had to the factory or to the technical college; whether a combination of these two is desirable or necessary, and if so, in what manner they should be combined; and whether the course at the technical college should be entirely by lecture and experiment, or should make free use of that royal road to excellence, the text-book; these and kindred questions will always be discussed and will never be settled. Whilst the discussion goes on the writers of text-books continue to flourish until the difficulty of deciding whether to have recourse to text-books or not is overshadowed by the greater difficulty of deciding which would be the most profitable to read. The three books before us illustrate how the budding electrical engineer may be caught when he is yet fresh in knickerbockers and led by easy steps to a complete mastery of his profession. Mr. Ashford's "Electricity and Magnetism" is a school-book; it starts by assuming that the pupil has no knowledge of the subject at all, and, leading him by a path of experimental inquiry, ends by leaving him well fitted to begin on Mr. Crapper's more advanced treatise. This read,